

311/01

BIOLOGY (MODULAR)

MODULE BI1

P.M. TUESDAY, 5 June 2001

(1 hour 40 minutes)

For Examiner's Use Only

Total Marks	
------------------------	--

Centre Number

Candidate's Name (in full)

Candidate's Examination Number

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. Answer the following questions in the spaces provided.

(a) Define the term *osmosis*. [2]

.....

.....

.....

.....

(b) What word describes a plant cell which has gained a maximum amount of water? [1]

.....

(c) What word is used to describe a cell where the cytoplasm has pulled away from the cell wall? [1]

.....

(d) In what way is active transport different from osmosis? [1]

.....

.....

(e) What is the effect of cyanide on active transport? [1]

.....

.....

(Total 6 marks)

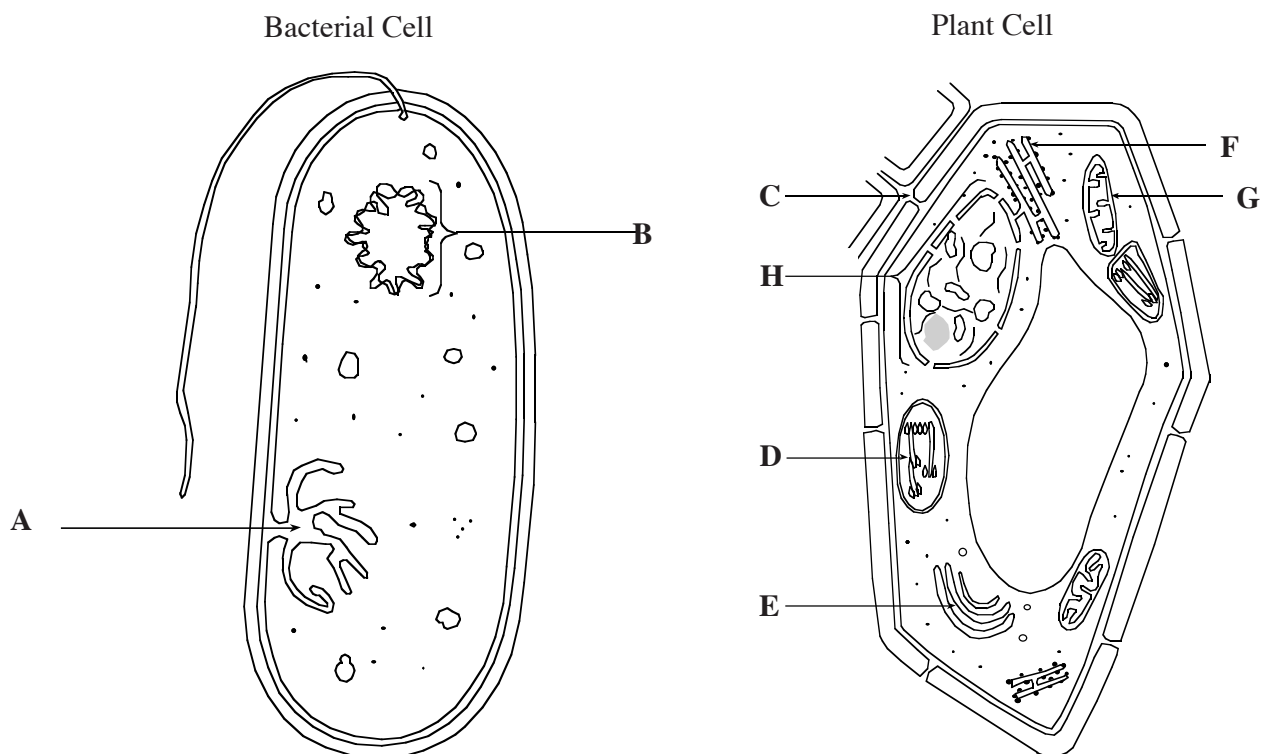
2. The following table lists some features of biological compounds. Complete the table by ticking (✓) in the appropriate column(s) if the feature is found in carbohydrates, lipids or proteins. You can tick one, two or three columns for each feature.

<i>Feature</i>	<i>Carbohydrate</i>	<i>Lipid</i>	<i>Protein</i>
can be saturated or unsaturated			
contain peptide bonds			
contain the elements carbon, hydrogen and oxygen			
can contain disulphide bonds			
cellulose and glycogen are examples			

[5]

(Total 5 marks)

3. Carefully study the drawings below made from observations of electron micrographs.



- (a) Cells are divided into two major groups according to their structures. To which group do the above cells belong. [2]

Bacterial cell

Plant cell

- (b) Name the structures indicated by the following letters on the diagrams above. [3]

A

B

C

- (c) State **one** difference between the structures labelled **B** and **H**. [1]

.....
.....

- (d) State the **main** function of the following structures. [4]

D

E

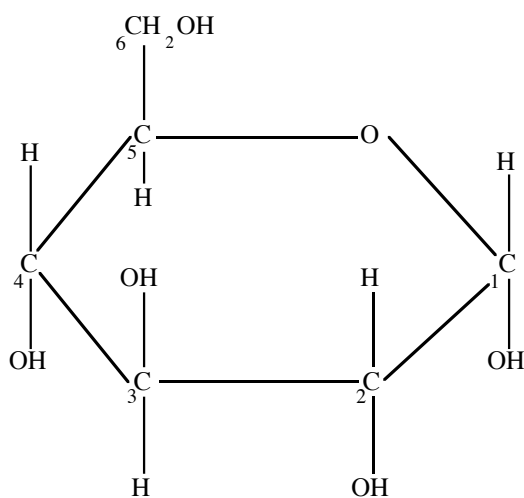
F

G

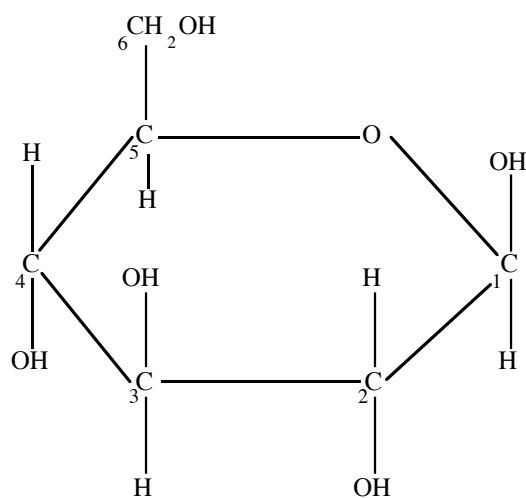
(Total 10 marks)

Turn over.

4. The diagram below shows two possible structures for glucose.



α glucose



β glucose

Both molecules α and β have the same general formula $C_6H_{12}O_6$.

- (a) (i) What is the term used to describe compounds with the same formula but different structure? [1]

.....

- (ii) Using the information in the above diagram distinguish between α and β glucose molecules. [1]

.....
.....

- (b) Indicate, by placing a ring around the appropriate atoms on the diagram above, which atoms are lost when the two glucose molecules join together. [1]

- (c) Name the bond that is formed when the molecules join together. [1]

.....

- (d) Name the sugar that is formed after the molecules have joined. [1]

.....

- (e) Starch and cellulose are both made up from a number of glucose molecules. Suggest **two** differences between the structures of starch and cellulose. [2]

(i)

.....

(ii)

.....

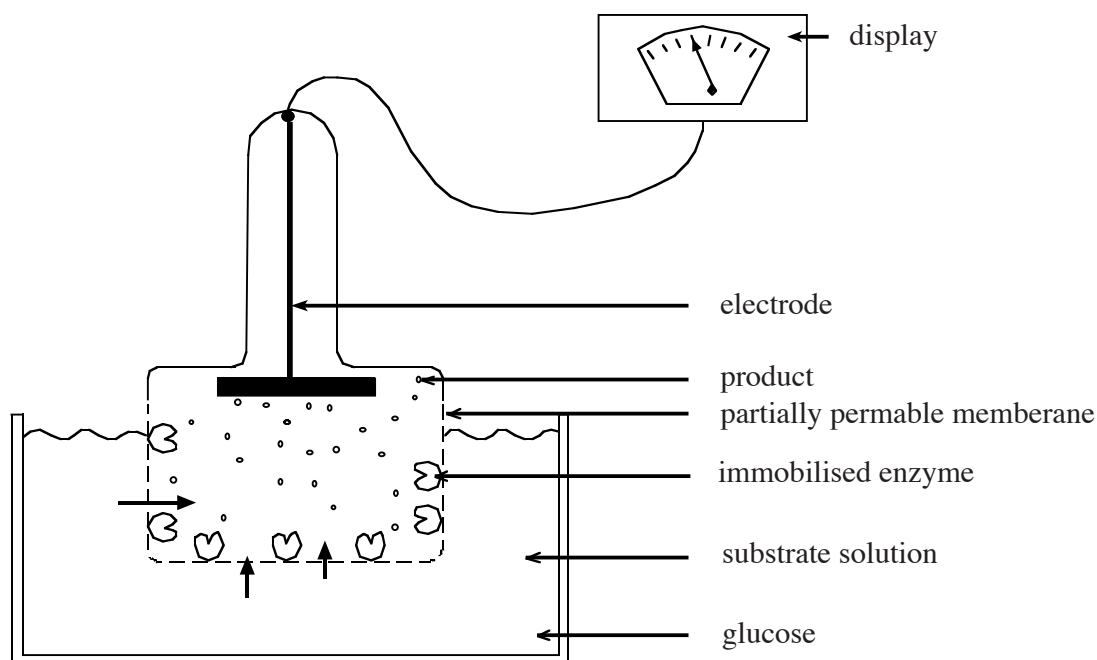
- (f) Give **one** function of **each** of the molecules in cells.

(i) Starch [1]

(ii) Cellulose [1]

(Total 9 marks)

5. The diagram below shows a possible structure for a biosensor that uses immobilised enzymes to detect glucose.



- (a) What are immobilised enzymes?

[1]

.....

.....

- (b) Suggest what happens when the glucose in the solution reaches the immobilised enzymes.

[2]

.....

.....

.....

- (c) Suggest the form in which the information about the concentration of glucose is transmitted to the display?

[1]

.....

.....

- (d) (i) Why should a buffer be added to the substrate solution?

[1]

.....

.....

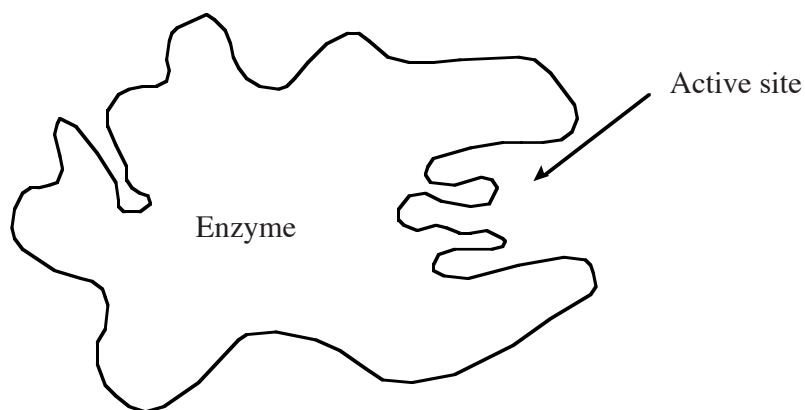
- (ii) Suggest **one** other variable that should be kept constant.

[1]

.....

.....

- (e) Competitive (X) and non-competitive (Y) inhibitors can be used to slow down or to stop enzyme controlled reactions. Label the diagram below to suggest where these inhibitors are most likely to act. Use X for the competitive inhibitor and Y for the non-competitive inhibitor. [2]



- (f) Describe how each of these inhibitors work. [2]

X

.....

.....

Y

.....

.....

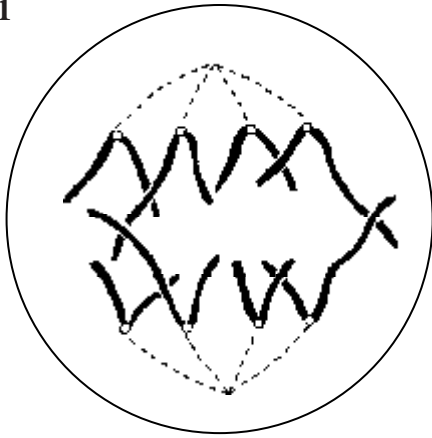
- (g) Give an example of a competitive inhibitor. [1]

.....

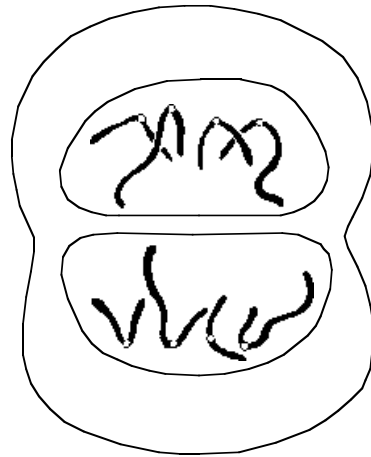
(Total 11 marks)

6. The simplified diagrams below show some of the main stages of mitosis, not in order.

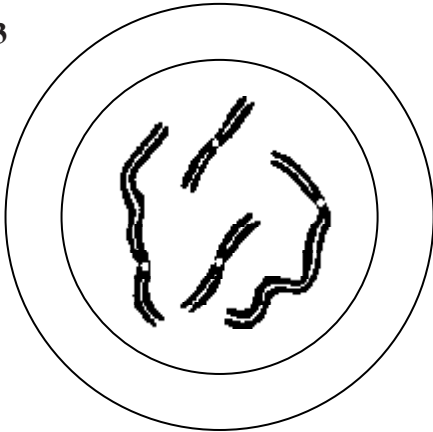
1



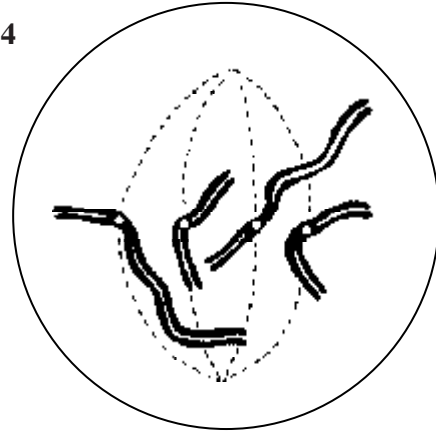
2



3



4



(a) State the name of each of the stages shown in the diagrams.

[4]

1.

2.

3.

4.

(b) Using the numbers 1, 2, 3 and 4, place the stages into the correct sequence to show the process of cell division.

[1]

.....

(c) State **two** differences between this type of cell division and meiosis.

[2]

.....

.....

.....

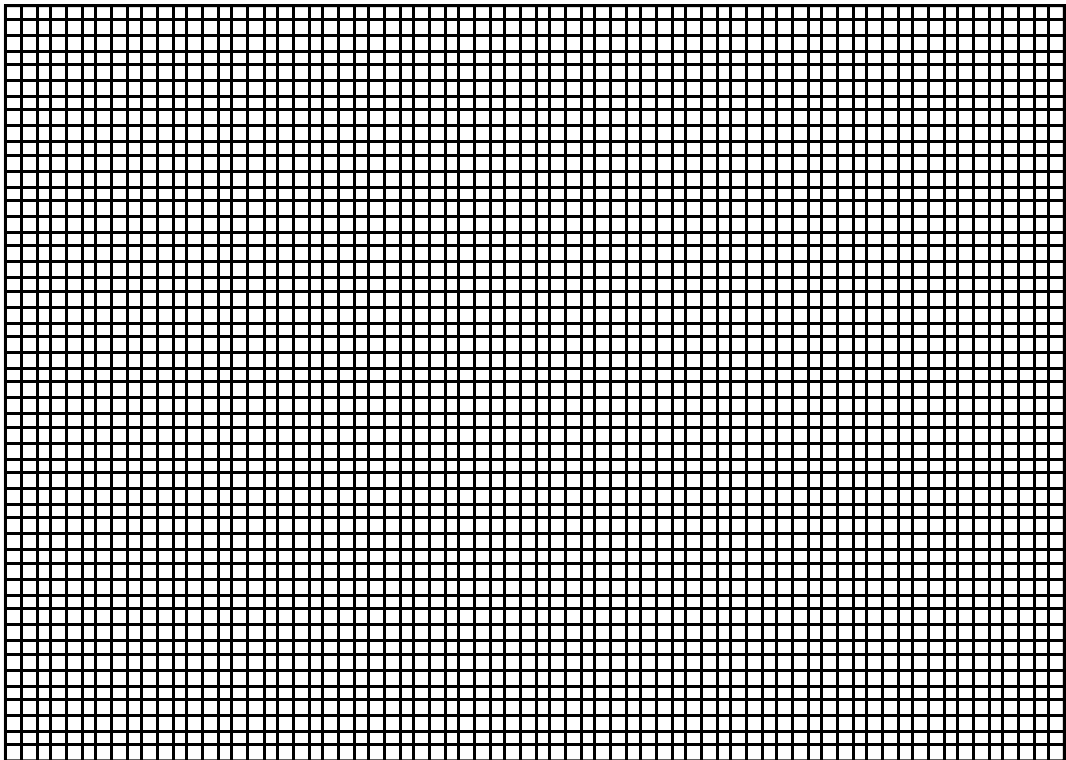
.....

(d) The table below shows how the quantity of DNA varies with time in a cell cycle.

Time in hours	0	5	10	15	20	25	30
Quantity of DNA measured in arbitrary units	4	4	4	8	8	4	4

(i) Plot a graph of the data in the table, on the graph paper below.

[3]



(ii) Explain fully the changes that have happened to the cell and why the quantity of DNA varies in this way.

[3]

.....

.....

.....

.....

.....

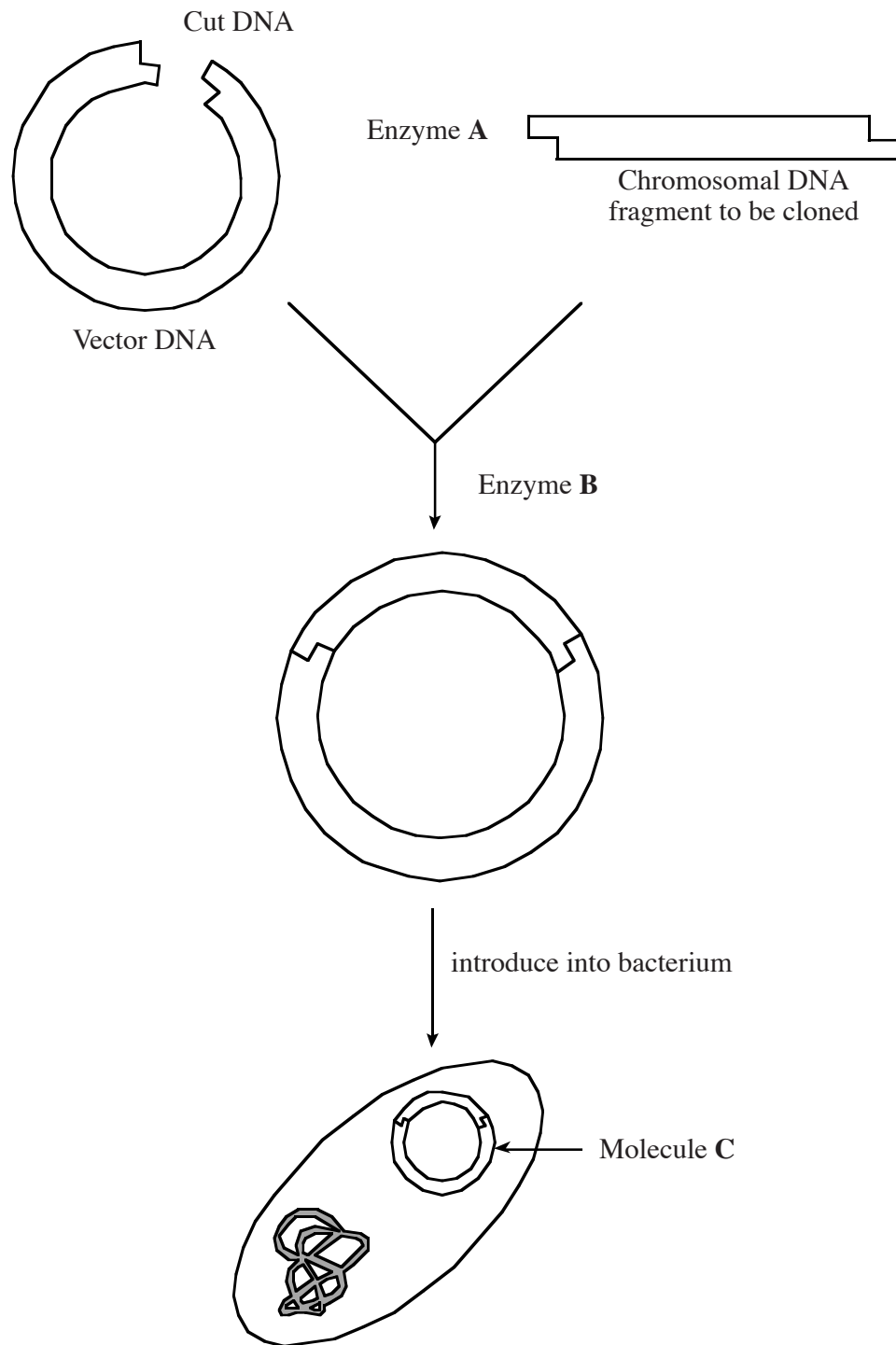
.....

.....

(Total 13 marks)

Turn over.

7. The following diagram is a simplified representation of a technique used in genetic engineering. Look carefully at the diagram and answer the following questions.



(a) Give the name of:

enzyme **A**;

enzyme **B**.

[2]

- (b) Suggest why the same enzyme (enzyme A) is used to cut both the vector DNA and the chromosomal DNA fragment. [2]

.....

.....

.....

.....

- (c) What is the function of enzyme B? [1]

.....

.....

- (d) What name is normally given to the molecule C? [1]

.....

- (e) Describe **two** ways in which the chromosomal DNA fragment can be obtained. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (f) What can be added to molecule C to aid in selection and identification of the cells that have successfully taken up the fragment? [1]

.....

- (g) Suggest a possible medical use for this technology. [1]

.....

(Total 11 marks)

[10]

OR (b) Describe the structure of DNA and explain how it replicates itself.

[illegible]

[illegible]

(Total 10 marks)